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Biological Control of Fusarium Crown and Root and Tomato (Solanum lycopersicum L.) Growth Promotion Using Endophytic Fungi from Withania somnifera L.

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Abstract : Fusarium Crown and Root Rot (FCRR) caused by Fusarium oxysporum f. sp. radicis-lycopersici (FORL) is a serious tomato (Solanum lycopersicum L.) disease in Tunisia. Its management is very difficult due to the long survival of its resting structures and to the luck of genetic resistance. In this work, we explored the wild Solanaceae species Withania somnifera, growing in the Tunisian Centre-East, as a potential source of biocontrol agents effective in FCRR suppression and tomato growth promotion. Seven fungal isolates were shown able to colonize tomato roots, crowns, and stems. Used as conidial suspensions or cell-free culture filtrates, all tested fungal treatments significantly enhanced tomato growth parameters by 21.5-90.3% over FORL-free control and by 27.6-93.5% over pathogen-inoculated control. All treatments significantly decreased the leaf and root damage index by 28.5-92.8 and the vascular browning extent 9.7-86.4% over FORL-inoculated and untreated control. The highest disease suppression ability (decrease by 86.4-92.8% in FCRR severity) over pathogen-inoculated control and by 81.3-88.8 over hymexazol-treated control) was expressed by I6 based treatments. This endophytic fungus was morphologically characterized and identified using rDNA sequencing gene as Fusarium sp. I6 (MG835371). This fungus was shown able to reduce FORL radial growth by 58.5–83.2% using its conidial suspension or cell-free culture filtrate. Fusarium sp. I6 showed chitinolytic, proteolytic and amylase activities. The current study clearly demonstrated that Fusarium sp. (I6) is a promising biocontrol candidate for suppressing FCRR severity and promoting tomato growth. Further investigations are required for elucidating its mechanism of action involved in disease suppression and plant growth promotion.

Keywords : antifungal activity, associated fungi, Fusarium oxysporum f. sp. radicis-lycopersici, Withania somnifera, tomato growth
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